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Pacific forms the conclusion is reached "that the trabecular, horizontal, and synapticular elements which compose the skeleton are thicker and coarser in the Atlantic and West Indian forms than they are in those of the Indo-Pacific."

After the descriptions are the following analytical tables:

Table I. Contains the Locality, the Depth or Geological Horizon, when given, references to published figures, the museums in which the type is preserved, and the page in this Catalogue where the detailed description will be found, for each form.

(With a supplementary Table of *Porites* from no recorded locality, some of which undoubtedly belong to the Indo-Pacific area; the list of known forms from that area is given in Vol. V., p. 248.)

Table II. Survey of the Geographical and Geological Distribution of the Atlantic, West Indian and European fossil representatives of the Genus, so far as at present known.

Table III. Analysis and Distribution of the Known Variations in Growth-form of the *Porites* of these same regions.

Table IV. Analysis and Distribution of the more easily definable Types of Calicle discoverable in the same.

In the supplement to *Goniopora* seventeen additional forms are described.

In concluding these remarks the reviewer wishes to state that he does not agree with Mr. Bernard's conclusions regarding the structure of the septa of *Porites*, and is opposed to the hypothesis of serial gemmation for each tabula in tabulate corals; he also considers that Mr. Bernard attributes too much importance to the geographic-number system for designating forms. The existence of the three factors favorable to the wide distribution of shallow water species of corals seems not to have been considered; these factors are: (1) Shoal water or intermittent shoals over extensive areas; (2) oceanic currents; (3) free-swimming larvæ. The reviewer, while recognizing the importance of isolation in causing divergence between coral faunas of separated areas, insists that some species of

corals have wide geographic distribution and that there is no more reason for doubting that morphological identity in corals means specific identity than there is for similar doubt in any other group of organisms.

Mr. Bernard discovered the principles underlying the septal arrangement for *Goniopora* and *Porites* and worked out the various palmar formulæ for the latter genus; he has shown students of *Madreporaria* the importance of studying in much greater detail the calicular structure of these corals; he has pointed out important calicular features that had previously received little or no attention; and his work on the growth forms of coralla is of importance. These are what the reviewer considers Mr. Bernard's solid contributions to the morphology of the poritid skeleton. The descriptive work of the catalogues is of value, for many forms are described in detail, excellent figures of a number of them are given, and they are referred to definite localities. No attempt was made to define species and to determine their distribution, as the data for such an undertaking were considered insufficient. However, when his contributions to the morphology of the skeleton are taken in connection with his descriptive work, Mr. Bernard deserves congratulations on having done much that will ultimately aid us in understanding the systematics of these perplexing corals.

T. WAYLAND VAUGHAN

DISCUSSION AND CORRESPONDENCE

THE FIRST SPECIES RULE: AN OBJECTION

TO THE EDITOR OF SCIENCE: Pray allow me to range myself with Dr. Bather in entering a caveat against the first species rule, at any rate for paleontology. It is demonstrable that such a rule fails to interpret the views of authors. It can be tested. There are authors who have stated or obviously indicated their genotypes; there are those who have not—in fact, the same author may come in both categories. Now if the former are always found to have placed their genotypes first then is the first species rule first for the latter; but if not, then it fails.

Authors have adopted at least four methods of arranging their species: (1) the technical, as I will call it; (2) the biological; (3) the stratigraphical, as Dr. Bather points out; (4) the alphabetical.

By the technical I mean that the author describes the genotype first, and then places his other species in sequence according to their degree of difference from it. This is the only plan to which a first species rule applies justly; but this plan, though it may be common in neontology, is certainly rare in paleontology, where any of the other three methods are more usual.

The biological system consists in arranging species according to their supposed genetic sequence; but the middle or last species may be the genotype—as often as the first. The biological plan may be stratigraphical in result; but not in intention. This biological method was used by Hyatt. For instance in his genus *Tropidoceras*, to name one case among many, he placed three species (*Bull. Mus. Comp. Zool.*, 5, 1867, p. 93). It can be seen from the method of his later works that he regarded these species as forming an anagenetic series, of which the first two were the immature, larval forms while the last was the mature, fully developed type of the genus; it conforms the best with his diagnosis. This, therefore, is the one to take as his genotype; a first species rule would do him injustice.

In my genera (*Mon. I. O. Amm.*, Suppl.) the species are arranged on Hyatt's plan—in supposed genetic sequence. My genotypes are stated; but had they not been, the first species rule would fail to interpret me correctly; my genotypes come frequently in the middle of the series—preceded by species biologically less, succeeded by species biologically more, developed.

The stratigraphical method was one much favored by the older paleontologists. In such a work as d'Orbigny's "*Prod. Pal.*" the whole arrangement is stratigraphical; that governs the first mention. Opening at random, I find *Cryptoceras* d'Orbigny first species mentioned *C. subtuberculatus* of the Devonian; but it is

obvious that he regarded as the genotype *C. dorsalis* of the Carboniferous.

In other works species may be arranged by zones or beds, beginning with the earliest; the first species need not be the author's type.

Of the alphabetical method an instance may be seen in M'Coy's "*Carb. Foss. Ireland.*" His first species of *Brachythyris* is *B. duplicicosta*. Dall in his most useful work, "*Index Names Brach.*," records this species; and the inference is that he regards it as the type. But M'Coy had depicted without final name a form of *Brachythyris* a few pages earlier; this is obviously his type and it is *B. oralis* which comes sixth. In *Martinia* the first species is *M. decora*, as Dall records; but M'Coy had figured an example in the same way, which is clearly a form he united under *M. glabra*; that comes third. Then M'Coy had given a further indication that he regarded *M. glaber* as his type—by using *Martinia*, for *glaber* is Martin's species.

Then there are cases in which the author indicates his type by making the generic name resemble a trivial one. Thus the obvious type of *Reticularia* M'Coy is *R. reticulata*; of *Fusella* M'Coy, *S. fusiformis*; of *Ornithella*, Deslongchamps, *T. ornithocephala*.

Since in these various cases where the genotype has been stated or obviously indicated the first species rule is demonstrably unjust, it follows that in other cases it is quite as likely to be wrong. A rule which presumes to interpret correctly in unknown cases must surely be able to show that it does justice in known cases. Tested by these the first species rule breaks down.

S. S. BUCKMAN

THAME, ENGLAND,

August 2, 1907

HOLOTHURIAN NAMES

DR. THEO. GILL, in the August 7 issue of this journal (p. 185) rightly takes exception to the use of *Holothuria* for a genus of echinoderms. In my paper on "*The Holothurians of the Hawaiian Islands*" I used the name in the sense that Théel, Lampert, Ludwig and every other writer in recent years has employed the term, and I did not, as Dr. Gill